Claims

[c1] A process for isotope separation comprising the steps of:

imparting a velocity and direction to a stream of material along a substantially linear path within an apparatus in a low-gravity environment;

heating and ionizing the material as it flows along the path to produce an ionized stream comprising ionized material;

confining the ionized material along the path to maintain a cross sectional area of the ionized stream;

deflecting at least some of the ionized material from the ionized stream to an individual ionized stream having a deflection orientation and angle away from the path, so as to separate the ionized material from any nonionized material within the ionized stream; and

collecting at least some of the ionized material from the individual ionized stream.

[c2] A process according to claim 1, wherein the apparatus is on a body that creates the low-gravity environment.

[c3] A process according to claim 1, wherein deflection of the ionized material is utilized to separate a stream of at least one individual isotope from the ionized stream.

[c4] A process according to claim 3, wherein the individual isotope deflected from the ionized stream is collected by impingement

on a moving surface to generate spatial patterning of the individual isotope.

[c5] A process according to claim 4, wherein the moving surface is a rotating surface.

[c6] A process according to claim 5, wherein rotating surface has an axis of rotation coaxial with the stream of material.

[c7] A process according to claim 5, wherein the individual isotope is deposited on the rotating surface to create an annular pattern on the rotating surface.

[c8] A process according to claim 5, wherein deflection of the ionized material is utilized to separate streams of at least two individual isotopes from the ionized stream, and the individual isotopes are deflected to different individual ionized streams and deposit as concentric annular patterns on the rotating surface.

[c9] A process according to claim 1, wherein the material is heated and ionized by electromagnetic radiation collected and concentrated by the apparatus.

[c10] A process according to claim 9, wherein the electromagnetic radiation is collected and concentrated with a cylindrical mirror.

[c11] A process according to claim 10, wherein the electromagnetic

radiation is sunlight and the cylindrical mirror collects and concentrates the sunlight to heat and ionize the stream of material while the linear path of the stream of material is oriented other than parallel to the direction of the sunlight.

[c12] A process according to claim 10, wherein the electromagnetic radiation is sunlight and the cylindrical mirror collects and concentrates the sunlight to heat and ionize the stream of material while the linear path of the stream of material is oriented perpendicular to the direction of the sunlight.

[c13] A process according to claim 1, wherein the velocity and direction imparted to the stream of material are caused by multiple feed devices, at least one of the multiple feed devices comprising a pair of electrostatic acceleration grids.

[c14] A process according to claim 13, wherein the multiple feed devices further comprise a radio-frequency electromagnetic field generator that partially ionizes the stream of material to create a plasma that is then accelerated electrostatically with the pair of electrostatic acceleration grids.

[c15] A process according to claim 13, wherein the multiple feed devices further comprise at least one impeller upstream of the electrostatic acceleration grids.

[c16] An apparatus for isotope separation, the apparatus comprising:

means for imparting a velocity and direction to a stream of material along a substantially linear path within an apparatus in a low-gravity environment;

means for heating and ionizing the material as it flows along the path to produce an ionized stream comprising ionized material;

means for confining the ionized material along the path to maintain a cross sectional area of the ionized stream;

means for deflecting at least some of the ionized material from the ionized stream to an individual ionized stream having a deflection orientation and angle away from the path, so as to separate the ionized material from any nonionized material within the ionized stream; and

means for collecting at least some of the ionized material from the individual ionized stream.

[c17] An apparatus according to claim 16, wherein the apparatus is on a body that creates the low-gravity environment.

[c18] An apparatus according to claim 16, wherein the deflecting means separates a stream of at least one individual isotope from the ionized stream.

[c19] An apparatus according to claim 18, wherein the collecting means comprises a moving surface that collects the individual isotope deflected from the ionized stream so as to generate spatial patterning of the individual isotope on the moving

surface.

[c20] An apparatus according to claim 19, wherein the moving surface is a rotating surface.

[c21] An apparatus according to claim 20, wherein rotating surface has an axis of rotation coaxial with the stream of material.

[c22] An apparatus according to claim 20, wherein the collecting means causes the individual isotope to deposit on the rotating surface to create an annular pattern on the rotating surface.

[c23] An apparatus according to claim 20, wherein the deflecting means separates streams of at least two individual isotopes from the ionized stream, and the deflecting means deflects the individual isotopes into different individual ionized streams that deposit as concentric individual annular patterns on the rotating surface.

[c24] An apparatus according to claim 16, wherein the heating and ionizing means collects and concentrates electromagnetic radiation to heat and ionize the material.

[c25] An apparatus according to claim 24, wherein the heating and ionizing means comprises a cylindrical mirror that collects and concentrates the electromagnetic radiation.

[c26] An apparatus according to claim 25, wherein the electromagnetic radiation is sunlight and the cylindrical mirror

collects and concentrates the sunlight to heat and ionize the stream of material while the linear path of the stream of material is oriented other than parallel to the direction of the sunlight.

[c27] An apparatus according to claim 25, wherein the electromagnetic radiation is sunlight and the cylindrical mirror collects and concentrates the sunlight to heat and ionize the stream of material while the linear path of the stream of material is oriented perpendicular to the direction of the sunlight.

[c28] An apparatus according to claim 16, wherein the imparting means comprises multiple feed devices, at least one of the multiple feed devices comprising a pair of electrostatic acceleration grids.

[c29] An apparatus according to claim 28, wherein the multiple feed devices further comprise a radio-frequency electromagnetic field generator that partially ionizes the stream of material to create a plasma that is then accelerated electrostatically with the pair of electrostatic acceleration grids.

[c30] An apparatus according to claim 28, wherein the multiple feed devices further comprise at least one impeller upstream of the electrostatic acceleration grids.